

# •Suisun Marsh Tidal Wetland Conceptual Model

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•**Purpose** : This conceptual model provides an information tool that describes existing tidal wetland ecosystem functions and processes in Suisun Marsh.

## Geomorphology

Remaining tidal marshes in Suisun consist of relict undiked marshes and small fringing marshes on the outboard sides of levees. Over 80% of Suisun's tidal marshes have been lost.

**Tidal Channels:** Carry tidal flow into tidal marshes. Well-developed tidal marshes have a complex network of branched channels. Vegetated banks are slightly higher in elevation than the adjacent marsh plain, forming natural low levees that reduce marsh plain inundation. Suisun's small fringe tidal marshes outboard of diked wetlands typically do not contain a network of tidal channels and are located adjacent to Suisun's largest channels and sloughs.

**Marsh Plain:** Low, middle and high marshes, with elevations from mean sea level to above the extreme high water. In Suisun's tidal marshes, elevations remain relatively constant, where sediment deposition and peat accumulation balances with soil subsidence and compaction and sea level rise.

**Salt Pannes:** Poorly drained flats depressions which have the lowest rate of tidal exchange of all the tidal marsh habitats. Pannes are shallow depressions in higher elevations of the marsh plain and are rare in Suisun Marsh due to extensive diking. Depressional topography of salt pannes limits drainage, resulting in higher soil salinity and lower rates of biological activity and peat building.

## Listed Species

California Clapper Rail (*Rallus longirostris alosinus*)



Sub Marsh Harvest Mouse (*Reithrodontomys umrinensis*)



Delta Smelt (*Hypomesus transpacificus*)



Suisun Thistle (*Cirsium hydrophilum* var. *hydrophilum*)



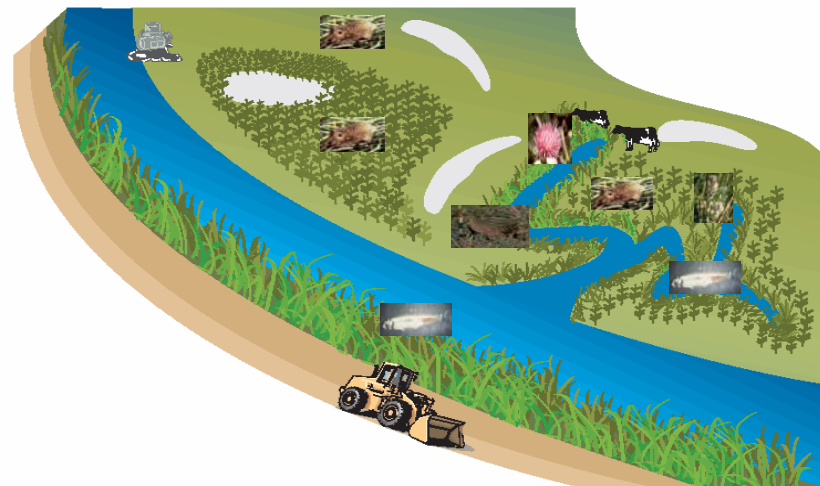
Soft bird's beak (*Cordylanthus mollis* spp. *mollis*)



## Stressors and Threats

Levee construction and maintenance, both historic and current  
Cattle grazing  
Nonnative invasive plants, particularly perennial pepperweed (*Lepidium latifolium*)  
Nonnative invasive animals, feral pigs, rats  
Salinity control gate operation, reduces natural salinity variation  
Petroleum spills from pipelines buried in Suisun Marsh and tankers in the Bay  
Public access and recreation

## TIDAL MARSHES OF SUISUN MARSH



## Key Processes

**Salinity:** Suisun Marsh is *brackish*, in transition between salt marshes in San Francisco Bay and freshwater marshes of the Delta. Brackish marsh salinity is a fluctuating, dynamic continuum between salt and freshwater marshes of its tributaries; salinity and vegetation gradients occur geographically and temporally. Variation in rainfall and soil salinity promotes a dynamic vegetation community composition and increases overall plant species diversity.

**External processes:** tidal water salinity, hydropereid, rainfall, marsh plain elevation, external freshwater runoff, tidal range

**Internal processes:** primary plant production, evapotranspiration, plant decomposition

**Soil and Sediment Dynamics:** Soils form through the external mineral sediment supply and organic material breakdown. Mineral sediments enter from tides and watersheds. Mineral sediments alter elevations of marsh plains and channels, act as contaminant source, and affect overall soil grain size. Both periodic and extreme wind, rain, and wave events resuspend sediments from mudflats and deposit these sediments on the marsh plain.

Suisun's tidal marshes have high levels of organic content. Saturated soils have lower oxygen concentrations, limiting the ability of aerobic microbes to decompose dead plants. Mature tidal marshes in Suisun accumulate peat under anaerobic conditions and the incomplete breakdown of organic matter.

## Uncertainties

### Geomorphology and Soils

- How will sea level rise affect the extent of tidal marshes in Suisun?
- What is the time period for sediment accumulation on subsided lands?
- How rapidly does peat form in brackish water habitats?

- How will fringe tidal marshes respond to tidal restoration?

### Invasive Species

- How much effort necessary to control *Lepidium* invasion;
- Will *Lepidium* and other nonnative plants invade restored sites;

### Habitat

- To what extent does peat soil matter for rare plants;
- What is status/baseline of state and federally listed species in Suisun
- What are the long-term responses of soft bird's beak and Suisun thistle populations to fluctuations in marsh salinity and tidal regimes?

### Restoration

- What effect will tidal restoration have on soft bird's beak and Suisun thistle;
- How much will focusing management and restoration decisions on listed tidal marsh species benefit other native tidal marsh species in Suisun;
- Can restored marsh have all the functions and processes active in existing tidal marsh?

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